ON THE

STUDY OF NATURAL HISTORY,

AS A

BRANCH OF GENERAL EDUCATION

IN

SCHOOLS AND COLLEGES:

BEING A PAPER READ BEFORE THE

NATURAL HISTORY SOCIETY OF BELFAST,

ON THE EVENING OF THURSDAY THE 26TH NOV. 1840.

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PHILLIPS, GREER, HODGSON, AND M'COMB.

1840.

At a Meeting of the Council of the Natural History Society of Belfast, held on the 3d December, 1840, it was resolved—

That the Paper read by Mr. Patterson, at the Museum, on the last night of Meeting, be printed at the expense of the Society.

That the following Members, *viz.:* the Rev. Dr. Cairns, Professor Stevelly, Dr. T. H. Purdon, and Dr. Patton, be appointed, together with the Officers of the Society, as a Committee for its distribution and sale; and for carrying out, as far as is in their power, the suggestions therein contained.

Note. In the Paper as now printed, the Author has, for the sake of brevity, omitted several illustrative Extracts from published works.

INTRODUCTION.

THE importance of the Study of Natural History is not as yet generally recognised. By some it is viewed with derision; by others it is regarded as a kind of busy idleness; or, at best, as a harmless occupation. The advantages it confers are, even by many educated men, unappreciated,—its effects on the intellectual and moral character, disregarded or unknown. It is proposed in the present paper, to endeavour to remove these misapprehensions, to substitute in their stead a just estimate of the study, and of its mental effects; and to advocate its universal adoption, both in schools and colleges, as an important branch of general education.

But, at the very outset, the question may be asked, "What is the use of Natural History?" And by the word *use*, in such a question, is understood—In what way will Natural History increase a man's profit, protect him from loss, or augment his personal comfort? I pause not here to consider whether or not the question of *cui bono?* is not at the present time put too frequently, and too pertinaciously,—whether we do not sometimes leave the higher regions of science uninvestigated, while we try to wring some practical application out of a partially-revealed truth. The desire of testing the utility of every pursuit, by some speedy and profitable result, prevails so universally, it might perhaps be needful to show, that, even on that ground, the study of Natural History is deserving of attention.

If so, it would only be necessary to quote from published works a few well-authenticated instances of loss, danger, or inconvenience, arising from the want of that information, which even an elementary knowledge of Natural History imparts. Such blunders are but too numerous; and though occasionally

they may seem ludicrous, afford, on the whole, melancholy examples of the evils produced by ignorance, of time and labour misemployed, money uselessly squandered, and, sometimes, a temporary annoyance or loss, increased tenfold by the injudicious effort made for its removal. If to the weight of such evidence we add the fact, that the whole of our food, clothing, and habitations, are of necessity derived from the animal, vegetable, or mineral kingdoms, there will not, it is presumed, be any one hardy enough to deny that a correct knowledge of such things must be both desirable and advantageous.

It is not, however, from these considerations that I have been induced to come forward as the advocate of Natural History. I pass on, therefore, to consider the

EFFECTS OF THE STUDY OF NATURAL HISTORY ON THE MENTAL FACULTIES AND FEELINGS.

It may be premised, that the study, though suitable for manhood, is highly attractive to youth; and bends itself, with easy adaptation, to the varying intellectual capacities of its votaries. To the very young,—to children only four or five years old, its objects are perhaps among the most pleasing that can be presented to their notice. At that age, when the observant faculties are in constant action, and the reasoning powers are as yet immature, the flowers, the shells, the birds, or quadrupeds, by which the child is surrounded, form naturally the primary subjects of his admiration and inquiry. Those who have had any experience in the management of children will testify with what delight they listen to stories about such things, when the narrator possesses the art of making himself intelligible to the capacity of his auditors. How frequently is he again and again asked for the recital, while each repetition serves only to enhance its charms. Should the teacher be collecting flowers in spring, or gathering the shells which are scattered over the strand, he will find in children his most delighted and zealous assistants, and will mark with what facility they can be taught to discriminate the several kinds, and to recollect the names of those which are the most attractive. And if the same individual—whether a parent or a

teacher—be speaking on the subject to the same children some weeks afterwards, he will find, as I have often done, that the facts of which he knew they had been cognisant, were, in truth, but a small portion of those actually observed, and that a whole host of concomitant circumstances, and vivid, though sometimes fantastic, associations had been connected, by the children, with the visible objects to which he had supposed their entire attention had been directed. From such facts it may be fairly inferred, that *Natural History is a study peculiarly well adapted for early youth.*

By thus directing the attention to various external objects which are regarded with interest, we learn the very useful habit of "having our eyes about us." We have all read in our school-boy days the story of "eyes and no eyes;" and we all know the difference which exists among educated people, as to the power of observing what is actually before their view. One sees a part only, and that imperfectly; another, at a glance, takes in every thing peculiar to the scene, almost by intuition. That prompt perceptive powers are desirable, and that they, to a great extent, are dependent on cultivation, every one will admit. The objects which Natural History embraces are well adapted to call these powers into action, and train them to promptitude and vigour. Hence, I rank among its intellectual effects, the *beneficial influence it exerts on the observant faculties.*

But this influence is not limited to quickness in using our eyes. As we advance a little beyond childhood, it takes in a wider sphere of usefulness. It teaches us to note resemblances among objects; thus enabling us, in some degree, to group them together by their apparent affinities; and it accustoms us also to mark the differences among those which, in many particulars, are alike. On this all classification among external objects must depend: on this must rest the divisions of classes, families, genera, and species, so indispensable to the Naturalist. To discover resemblances, to detect differences, are processes totally distinct from the mere power of observing. They are not acts of the perceptive, but of the reflective, faculties. They require not merely the exercise of our eyes, but of our powers

of comparison and judgment. In other words, *by the study of Natural History, we acquire habits of discrimination.*

The pupil soon, however, discovers that many of his hastily-formed ideas, and rapid generalizations, are erroneous. He finds that, to draw his conclusions with any certainty, the observations on which they are founded must be perfectly accurate; and not only accurately made, but accurately expressed, otherwise they will convey false impressions to other minds. *It enforces, therefore, accuracy in every particular.*

And to make knowledge available, it is needful that its facts be systematically arranged. Without arrangement all is a chaos—"*rudis indigestaque moles.*" With arrangement, knowledge becomes at all times ready for service, and each accession enriches, not encumbers, its possessor. Whether he seek to acquire or to impart information, the student of nature is compelled to be methodical; and if he desire to illustrate any department of study by suitable specimens, they must be arranged before they can be rendered available. *Natural History, therefore, directly promotes the formation of orderly and sytematic habits.*

But, in the next place, it benefits the mind, by vesting with new and increasing interest the objects by which we are surrounded; thus furnishing agreeable trains of thought in the hours of relaxation. Time to the naturalist never appears long. He groans not under the load of ennui, by which others, in such circumstances, are occasionally oppressed. He finds active, healthy, cheerful occupation for every moment; and still the thirst for knowledge "but grows by what it feeds on." *To stimulate a constant desire for improvement, and to foster a buoyant activity of mind and spirit,* no pursuit is more serviceable than that now under consideration.

To a mind thoroughly embued with the knowledge which this study imparts, *every scene presents itself under new and peculiar aspects.* The kind of mental effect thus produced may be illustrated by one or two examples. If an intelligent man were placed in a gallery of paintings, he would be perhaps delighted with the colouring of some, or the grouping, attitude, and expression of others. But let a painter visit the same

gallery, and how numberless would be the beauties which his eye would detect, how vast the skill and excellence which his glance would discover!—while the one would be merely "seeing," the other would be "analysing."* In the same way, let one who is not indifferent to the "concord of sweet sounds" listen to an oratorio, and, pleasurable as his emotions may be, how infinitely do they fall short of those experienced by one to whom the principles of the art, and the skill of the musician, are alike familiar. The bodily sensations are the same, but the perception and enjoyment are altogether different. The minds contemplate the objects through different media; and their aspect is as different as the mountain side when dimmed by mist, or radiant with the golden light of eve. To behold the brightness is the prerogative of knowledge; and under such an aspect does Nature ever present herself to the Naturalist.

But the fact, that he contemplates the external world under a more attractive garb than other men, does not, as might be supposed, generate a feeling of pride or self-sufficiency. If such an emotion should be produced by contemplating, from the first slight elevation of his course, the ground he has gone over, it is instantly checked, when he turns his eyes to that which lies before. Here "Alps above Alps arise;" and by him who has climbed the highest will the greater altitude of the untrodden summits be best appreciated. The more we do, the more we feel that much remains undone; that mightier tasks are yet to be accomplished; and that our utmost knowledge in this state is but "the palpable obscure" of ignorance. Those whose faculties are the most transcendent, and whose knowledge is the most ample, are ever the most willing to admit the restricted capability of the one, and the limited domain of the other; as Newton, after all his splendid discoveries, said, that he was like a child, who had been playing with pebbles on the sea-shore, while the great ocean of truth lay untraversed before him. I place, therefore, among the

* This illustration is most happily brought out in Dr. Drummond's Letters to a Young Naturalist, p. 37.

mental effects of this study, *a true and fitting sense of the imperfection of human faculties, and the limited amount of human knowledge.*

The humility arising from these sources is, however, inculcated by other departments of knowledge. I pass on, therefore, to one peculiar to Natural History. Pride delights to contemplate man as lord of the earth, vested with dominion over all its animated tribes, and gifted with "form and faculties so express and admirable." But when science marshals before us the tribes of earth and air, when she unveils the animated millions which lurk unseen around us, or those which make the ocean their abode, we soon discover, that the least of these, displays the perfection of creative skill, and evinces the superintending goodness of the Almighty not less than man himself. *We learn, therefore, with true humility, that we alone are not the recipients of* His *bounty, the objects of* His *care, the living evidence of* His *consummate handiwork.* Nor is this lesson to be drawn only from the present tribes of animated beings: those of ages long past declare to us, in their altered but imperishable bodies, the same great truth. As an example, I may refer to the account given by the Rev. Dr. Buckland,* of the singular structure of the *Briarean Pentacrinite*, a species of marine animal now extinct.

After stating that it possessed "a hundred and fifty thousand bones, and three hundred thousand fasciculi of fibres, equivalent to muscles—an amount of muscular apparatus concerned in regulating the ossicula of the skeleton infinitely exceeding any that has been yet observed throughout the entire animal creation," he most truly and eloquently remarks, "When we consider the profusion of care and exquisite contrivance that pervades the frame of every individual in this species of Pentacrinite, forming but one of many members of the almost extinct family of Crinoideans; and when we add to this, the amount of analagous mechanisms that characterise the other genera and species of this curious family, we are almost lost in astonishment, at the microscopic attention that has been

* Bridgewater Treatise, page 440.

paid to the welfare of creatures holding so low a place among the inhabitants of the ancient deep; and we feel a no less irresistible conviction of the universal presence and eternal agency of creative care in the lower regions of organic life, than is forced upon us by the contemplation of those highest combinations of animal mechanism, which occur in that paragon of animal organization—the corporeal frame of man."

Another mental effect, arising from the knowledge of Natural History, is *the liberation of the mind from idle hopes or superstitious fears connected with the actions of the inferior animals.* To one who knows their habits, neither the flight, nor the call of birds, will be prognostic of good or evil. The running of a hare across his path will not, to the Naturalist, be an augury of misfortune, nor the chirping of the cricket on his hearth, a "harbinger of good." Their actions will by him be regarded as dependent on causes then in operation, and not as indicative of events which are to come. To estimate aright the importance of this freedom, let us but consider for a moment how extensively the hooting of the owl, or the croaking of the raven, are viewed as foreboders of evil; how slowly these ideas give place before advancing knowledge, and how pertinaciously human belief clings to "preternatural solicitings," long after their fallacy has been established. When speaking of the "heart-sickening tick" of the death-watch—which is, in reality, but the call of one of the small timber-boring beetles, —Kirby and Spence make an observation applicable to every department of Natural History: "Attention to Entomology may be rendered very useful in this view, since nothing certainly is more desirable than to deliver the human mind from the dominion of superstitious fears and false notions, which, having considerable influence on the conduct of mankind, are the cause of no small portion of evil."*

The variety of aspect which superstitious fears assume, in connection with the appearance or actions of certain animals, seems perfectly Proteus-like; and appears in some new form, just at the moment we think that the monster is overcome. We

* Introduction to Entomology, vol. I. page 36.

learn from Reaumur, that, in the suburbs of Aix, in 1608, amazement and consternation were spread among the populace, by what appeared to be showers of blood. A Naturalist removed the alarm, by showing that the supposed rain was caused by a butterfly, which, at the moment of its emerging from the chrysalis, let fall a drop of reddish fluid. In our own country, in the summer of 1832, unusual multitudes of a small species of gnat appeared, and were viewed by the ignorant with awe, as precursors of the Cholera Morbus, an epidemic then fatally prevalent.* A common, two-winged, little insect was thus gifted with the dread appellation of the Cholera fly! But even where there exists no superstitious terror, an evil of another kind is occasionally felt, which knowledge only can remove. Thus, in 1788, an alarm was excited in Great Britain, by the fear of importing, in cargoes of wheat from North America, an insect, known by the name of the Hessian fly, whose dreadful ravages had extended from Long Island to the distance of two hundred miles inland. "The privy council sat day after day, anxiously debating what measures should be adopted to ward off the dangers of a calamity more to be dreaded, they well knew, than the plague or pestilence. Expresses were sent off in all directions—dispatches written to the ambassadors in France, Austria, Prussia, and America;" and at length it was, through the knowledge and suggestions of that illustrious Naturalist, Sir Joseph Banks, that they were enabled to form some kind of judgment on the subject.†

But while the knowledge of Natural History dissipates many ignorant or superstitious fears, it produces one effect on both the head and heart, which many will deem not less important. By keeping alive the desire to observe and to know,—to search out the TRUE, to appreciate the BEAUTIFUL,—it prevents the springs, which, in early life, well out within our hearts their pure and nursing waters, from being utterly choked up by the

* Entomological Magazine, No. II. page 147.

† Young's Annals of Agriculture. For a highly interesting notice of these proceedings, see Kirby and Spence's Introduction to Entomology, vol. I. p. 50, whence my own information is derived.

cares, the struggles, and too oft the engrossing worldliness of manhood.

I have not yet done. I have spoken hitherto of the intellectual *effects* of the study: but, like other departments of science, it brings with it a store of intellectual *pleasures* in both the pursuit and the acquisition, to which it is now proper to advert. In pourtraying the pleasures which a knowledge of Nature imparts, many amiable, learned, and eloquent writers, have employed their powers. Among them I am glad to number him by whom our Natural History Society was established, and who has filled, for nearly twenty years, the office of its President.

What has been so ably done, I seek not to emulate; and shall, therefore, but enumerate some of the most obvious sources of these pleasurable emotions. There are, however, delightful, but evanescent trains of thought which cannot thus be exhibited. Too fugitive to be arrested and delineated,—too delicate to be shadowed forth in language, they serve as an example of the truth, so beautifully expressed by the poet:—

"The air in which we breathe and live
Eludes our touch and sight;
The fairest flowers their fragrance give
To stillness and to night;
The softest sounds that music flings,
In passing from her heaven-plumed wings,
Are trackless in their flight!
And thus life's sweetest bliss is known
To silent, grateful thoughts alone."

B. Barton.

INTELLECTUAL PLEASURES DERIVABLE FROM THE STUDY OF NATURAL HISTORY.

The first three I shall mention are common to other departments of physical science, and cannot be stated more briefly than in the words of Lord Brougham, in his address on the Objects, Advantages, and Pleasures of Science.

"There is something positively agreeable to all—to all at least whose nature is not most grovelling and base—in gaining knowledge for its own sake.

"There is also a pleasure in seeing the uses to which knowledge may be applied, wholly independent of the share we ourselves may have in those practical benefits.

"It is another gratification to extend our inquiries, and find that the instrument or animal is useful to man, even although we have no chance ourselves of ever benefiting by the information."

But how much more vivid this emotion becomes, when we have the pleasure of seeing the beneficial effects of one animal or plant in giving employment to thousands, and multiplying the comforts of the whole civilized world. Is it needful to adduce, as an example, the silk-worm or the cotton-plant?

It is universally admitted, that we never so much prize the blessing of health, as during the period of convalescence. So it is in observing the operations of the animal world; when, for wise purposes, the checks upon the destructive powers of certain tribes are for a time withdrawn, we read, with a strange and troubled pleasure, the narrative of their devastations, and revert, with delight and admiration, to what may be regarded as their ordinary condition.

There is besides a refined and subtle pleasure in tracing affinities in structure and habit; and in framing analogies between widely separate species.

There is another kind of pleasure in tracing, in the vegetable and animal kingdom, the evidence of design—the arrangement of means to an end. I speak not here of the devotional feeling which such observations naturally excite—that will be treated of hereafter—but merely of the delight we experience in witnessing an elaborate and skilful piece of mechanism. The intellectual gratification which this excites is of a very high order; and it is called into action wherever we turn our eyes, whether we examine the cupping instruments of the gnat, or the flexile proboscis of the elephant.

Akin to this, but different, is the pleasure of tracing the functions to which this beautiful mechanism is at times subservient.

The various modifications of respiration, circulation, absorption, &c. will serve as illustrations.

And next in order may be mentioned the pleasure of observing the precautions adopted for the continuance of the various tribes. Thus, in plants, we notice an infinite variety of contrivance in the protection and dispersion of the seeds—the preservation of the seed-vessels, &c. In animals we find some brought forth alive; some springing from eggs deposited in suitable situations; and others becoming invested with life, in modes so wonderful, that the fictions of the poet are tame and unimaginative compared with the reality.

In my enumerations of the pleasures, I place next in order—

That of witnessing, in certain tribes, the changes of the animal from the young to the adult state, including the transformations to which some are subjected.

That of watching the care, the stratagems, and the courage evinced by various species for the concealment and defence of their offspring.

That of marking the growth or development of the powers, faculties, and instincts peculiar to the species.

That of noting the various means for concealment or defence, each so excellent in itself, and so admirably adapted to the situation and mode of life of the animal.

That of comparing the written descriptions with the specimens, and marking the unvarying, yet minute, differences observable in certain species. I have a vivid recollection of the delight experienced, at almost the commencement of the little botanical knowledge I possess, from observing, on the under side of the leaves of the scarlet pimpernel, the minute dots recorded by botanists.

That of remarking the occurrence of some rare species, or of adding to the *Fauna* or *Flora* of the country one previously unrecorded.

That of observing the differences by which particular seasons are distinguished, as the late or early arrival of certain migratory birds, or the abundance, scarcity, or entire absence of certain insects.

That of noticing the prevailing uniformity by which the

passage of the various months is distinguished; and thus connecting in our minds the blossoming of a fragile flower, with the annual revolution of a planet wheeling in her appointed course.

There is a host of pleasures awaiting the Naturalist in every country walk, or every ramble on the beach. These must be felt to be properly appreciated; and he by whom they have once been experienced will alone comprehend the delight of carrying with him, wherever he turns his steps, "gems hidden from the world beside."

These pleasures connect themselves with an invaluable store of cheerful occupation during periods of debility, or in those vacant intervals, to which even the most busy are occasionally subjected. I can speak, from my own experience, of the happy influence of Natural History at one such period, when, after a severe illness, a walk of even a mile brought feelings of weariness, I found, during some weeks in retired lodgings on the sea-coast, that the longest summer day was too brief for the employments and investigations which the ocean furnished.

Nor is it the least of these pleasures,—that the knowledge, by which they are accompanied, is real. We gain truth instead of fiction—the TRUE as distinct from the IDEAL. But while Natural Science thus draws the line of demarcation, it destroys not the "lovely visions" which connect Natural History with Poetry. The ancients, while they described their poets as swans, and attributed to them melodious powers at the approach of death, were perfectly aware of the shrill and piercing note which the bird itself possesses. When, therefore, our own Shakespeare says,

> ——— "I will play the swan,
> And die in music,"—*Othello, Act 5. Sc.* ii.

We suppose not for a moment that he was ignorant of the note of the wild swan; but that he makes use of a poetic fiction, which, *as such*, we admire and appreciate. In like manner, we hesitate not to speak of halcyon days, or of the Phœnix rising from its ashes: knowing these to be poetic fictions, we delight in them as such. In fact, not one of the sweet links which connect the physical world with the ideal is destroyed. When the fiction is proved to be a fiction, we

have then two sets of ideas belonging to the same object. One is the fiction, which ofttimes gains new interest, as giving us the phases of human thought and knowledge of a bygone period; and the other is the simple real truth, which not unfrequently is more wonderful than even the fiction.

> "The tender Nautilus, who steers his prow,—
> The sea-born sailor of his shell canoe,—
> The ocean Mab,—the fairy of the sea,"
>
> Byron.—*The Island, Can.* 1. *St.* xii.

can no longer be regarded as entitled to this portraiture. The researches of Madame Jeanette Power and M. Sander Rang have, in the last year or two, shown that the cuttle-fish, by whom the shell is formed and inhabited, possesses not the sails and oars by which it was gifted by preceding Naturalists, from Aristotle downwards; that it moves in the open sea, in the same manner as other *cephalopods*, and that the arms, which are expanded into membranes, and envelope its abode, are organs employed—not as sails—but for the structure and repair of the fragile tenement.* Yet it is still in our imagination the nautilus of former days, "to whom the ancients assigned the honour of having first suggested to man the possibility of traversing the sea in ships," exhibiting his own elegant and pearly barque, propelled by sails hoisted to the breeze, and guided by oars provided for the purpose.

While, in the progress of knowledge, the descriptions of ignorance must fade before the light of truth, the fiction is not annihilated, but assumes its proper character. It apes not the semblance of reality, but commends itself as the child of imagination; and, with that vividness which poetry alone can assume, becomes transferred to our minds, with all its fanciful, grotesque, or shadowy accompaniments, as if pourtrayed there by some sort of mental Daguerrotype.

Let no one, therefore, fear that, as his knowledge increases, his poetic associations will be destroyed. He who takes delight in "thoughts that breathe, and words that burn," will never be despoiled of them by knowing aright the minerals,

* Jones' Outline of the Animal Kingdom, pages 434, &c.

the plants, or the animals by which he is surrounded. On the contrary, the sphere of his poetic susceptibilities will be enlarged as his knowledge becomes extended, and the variety of objects in which he takes an interest, will effectually protect him from the cold and heartless condition of the pedlar described by Wordsworth,—

> In vain, through every changeful year,
> Did Nature lead him as before;
> A primrose by a river's brim,
> A yellow primrose was to him—
> And it was nothing more.

MORAL AND DEVOTIONAL EFFECTS.

In treating of the mental effects of the study, and of the pleasures with which it is connected, I have endeavoured to enumerate the principal points, not to bring them forward in detail, and with all their fitting illustrations. In like manner, I shall now attempt to indicate the existence of many veins of precious metal, but not to work any one of them until the mine be exhausted. In one word, it shall be my object rather to suggest trains of thought, than to bring them forward at full length, or attempt to pursue their several ramifications.

It has been already observed, that Natural History enlarges our sympathies with all the beings that have life; thus taking our thoughts from the circle of petty cares and selfish exertions which, in the race of worldly competition, is so apt to narrow around us. By thus giving us an interest in things beyond ourselves, an interest uncontaminated by even the remotest prospect of gain or loss, it prevents SELF from assuming an undue preponderance as a motive to action, and predisposes the mind and affections to take part in what relates to the well-being of our fellow-creatures.

Its effect in this way is much increased by the habitual tenderness which it generates towards the inferior animals. Humanity to them becomes a constant and active principle of action; and it is scarcely possible that this feeling could exist in full development and corresponding activity, and be accom-

panied by cruelty to our fellow-creatures, or indifference to their suffering. Natural History, therefore, tends to render men humane.

In a former place, I have noticed the cheerful and active frame of mind inseparable from this pursuit. If to this we add its unselfish and humane tendencies, it is obvious, that the study, if pursued aright, is not without an important influence in cultivating qualities, both of head and heart, of high importance in the performance of our social duties as members of society.

When enumerating the intellectual effects and pleasures attendant on the pursuit, those arising from skill in the structure, and care in the preservation of animals, were mentioned. But the mental effect is not limited to the production of a transient emotion of pleasure: it is the prelude of a long train of thought, and of the most grateful and reverential feeling towards the Great First Cause. The structural arrangements, admirable as they are, should never be regarded merely as examples of mechanical skill, as evidence of the operations of an Intelligence, as proofs of the existence of a God. They testify not only his existence, but his wisdom, his goodness, and his omnipotence; and should ever be studied with a direct and constant reference to Him. The Naturalist who, in this humble and truth-seeking spirit, explores the world around him, will ever feel what the poet has expressed, "These are THY glorious works, Parent of Good—Almighty!"

If viewed in this light, the actions of the inferior animals become elevated into so many manifestations of the Almighty Intelligence, from whom they derive their being. Hence, Bonnet says, in a brief but happy metaphor, "When I see an insect working at the construction of a nest or a cocoon, I am impressed with respect; because it seems to me, that I am at a spectacle where the Supreme Artist is hid behind the curtain."*

The instinctive actions of animals, for the nourishment, protection, or defence of their young, will, of course, be referred to

* *Contemplation de la Nature*, quoted in Insect Architecture, page 182.

HIM by whom such instincts were bestowed. But there are examples of providential care even more striking, where the young, instead of being thrown on the care of a parent, are gifted, for a time, with certain organs, which are withdrawn when once the purpose for which they have been given, is accomplished. Thus, along our rocky coasts, we see the stones covered for miles with small, white, conical-shaped bodies, so minute and so numerous, that fifty of them may sometimes be counted in a superficial space of one inch square: what millions must there be in a few hundred yards! These are known by the name of acorn shells or *Balani*, and remain immoveably fixed to the rocks on which they are seen. But they were not always thus: in their young state they were diffused throughout the waters, not only by the aid of tides and currents, but also by a striking and beautiful arrangement, under which they became active agents in their own removal to new localities. On their exclusion from the ova, instead of being helpless and quiescent, they swam freely about, by means of organs well adapted for the purpose; and they enjoyed ample powers of vision from two pedunculated eyes; at a certain period, they fastened themselves to the rock, lost for life the capability of changing their habitation, the density of their shelly covering increased, and the sense of sight, no longer requisite, was extinguished. "Thus, an animal, originally natatory and locomotive, and provided with a distinct organ of sight, becomes permanently and immoveably fixed, and its optic apparatus obliterated."*

Who can read of these things and not be convinced, that the study which supplies such evidence of the goodness and the superintending providence of God, must be, in a high degree, favourable to devotional feeling? This sentiment deepens in its intensity, if we examine the structure of some of the small marine animals, belonging, like these examples, to the invertebrate order. Instead of rigid and compact masses of diminutive size, which we might suppose would be those best fitted to stand the warring of the angry elements, we find forms so

* Zoological Researches, by J. V. Thompson, p. 78.

transparent, so fragile, so abounding with delicate organs, that they, at first sight, would seem adapted only for summer seas and glassy waters. Yet they live amid the tossing waves, and the species survive, from age to age, the fury of the ocean storms.

It is unnecessary to dwell on the fact, that when our attention is given to the minuter parts of creation, we find myriads of happy beings, making the solitary spots more populous than the most crowded cities; and on the strong assurance it affords, that HE, "whose tender mercies are over all his works," will not withhold from man the support and protection which is so graciously extended to all the inferior animals. It may not, however, be out of place to remark, that, by a knowledge of the structure and functions of these creatures, of the plants which decorate our sub-marine rocks, and of those which clothe our isle with verdure, we learn to estimate the mighty and ever-active influences which are at work, both in the air and in the waters, to ensure the continuance of the conditions on which their vitality depends. Imperfectly as the subject may, after all, be understood, enough is manifest to show the innumerable affinities, which link together the great and the little, the near and the remote, and make the mind revert to HIM by whom so harmonious a system was arranged. "How much of God," says Channing, "may be seen in the structure of a single leaf, which, though so fragile as to tremble in every wind, yet holds connexions and living communications with the earth, the air, the clouds, and the distant sun, and, through these sympathies with the universe—is itself a revelation of an Omnipotent Mind."*

Before concluding this part of my subject, permit me to remark, that to endeavour to attain some knowledge of the world around us, is a *duty*, inasmuch as all its animated tribes were called into existence by the same beneficent Providence from whom *we* derive our being. What God has been pleased to create can never be unworthy of man to study;† but the

* On the Ordination of the Rev. F. A. Farley.

† "Think not that anything he hath vouchsafed to create is unworthy thy cognisance, to be slighted by thee. It is pride and arrogance, or ignorance and

study should ever be prosecuted with a constant reference to the great Author of all. I am glad to fortify the opinions which I have here expressed by that of Archdeacon Paley, whose words may form an appropriate close. "In a moral view, I shall not, I believe, be contradicted, when I say, that if one train of thinking be more desirable than another, it is that which regards the phenomena of nature with a constant reference to a supreme intelligent Author. To have made this the ruling, the habitual sentiment of our minds, is to have laid the foundation of every thing which is religious. The world thenceforth becomes a temple, and life itself one continued act of adoration."

NATURAL HISTORY AS A BRANCH OF GENERAL EDUCATION.

In the preceding pages, I have endeavoured to show, that—independently altogether of any physical or pecuniary advantages—the Study of Natural History is deserving of general cultivation for three reasons:

1st, Because it exercises a sanatory influence, on both the perceptive and the reflective faculties.

2dly, Because it is accompanied by a long train of innocent, invigorating, and elevated pleasures. And—

3dly, Because it exerts a powerful influence on the moral and devotional character.

If partiality to a favourite pursuit has not warped my judgment, and I am right in attributing to the study of Natural History the production of such effects, I am fully warranted in desiring, that it should be made UNIVERSALLY a branch of school education.

The honour of first placing it in this position belongs, in this town, to our zealous Secretary, Mr. Bryce, who introduced it into his geographical class in the Belfast Academy. Of the good effects of this procedure, after it has been ten years in operation, Professor Bache bears witness in the following words:*

folly, in thee so to think. There is a greater depth of art and skill in the structure of the meanest insect than thou art able for to fathom or comprehend."
RAY.—*Wisdom of God in Creation.*

* Report on Education in Europe, page 380.

"The experience of this institution may be confidently appealed to in favour of the introduction of the Elements of Natural History into similar schools: it has not only been found to act favourably, by a direct development of the intelligence, but to re-act also as a stimulus to the classical studies, from the terminology which must be employed, even in the elements of the science. Under the direction of the Mathematical Master, the pupils have a Natural History Society, which has collected a very tolerable museum, and which serves to induce exertion out of the school-room."

In the Royal Academical Institution of this town, the same subject has, under the Rev. Wm. Hamilton, become a branch of education in the English school; and a "Juvenile Natural History Society," organised by the boys themselves, has held its meetings in the Institution for some years, under the guidance of the Mathematical Teacher, the Rev. I. Steen, who has latterly been joined in the management by Mr. Hamilton. Here also a respectable collection of specimens has been accumulated.

A distrust of the utility of such proceedings may, however, not unnaturally suggest itself to parental solicitude; and this cannot be stated more fairly, or removed more effectually, than by the following extract from a letter written by the Rev. Dr. Bryce, the learned Principal of the Belfast Academy:—

"The pupils, whose ages varied between the extremes of eight and eighteen, all entered with the greatest eagerness into these subjects; so much so, that, at first, I was short-sighted enough to feel some apprehension of their being led away from their severer studies, by this new and fascinating pursuit. But I was soon set perfectly at ease; for there was, in a very short time, a marked improvement in the manner in which the other parts of their business were performed, by those lads who had given themselves most passionately to mineralogy and geology. This was what I ought to have expected. When a taste is formed for any one intellectual occupation, it is easy to ingraft upon it a fondness for another."*

* Drummond's Letters to a Young Naturalist, page 311.

I may be permitted to adduce another evidence of the good effects of the introduction of Natural History into general education. My venerable friend, the Rev. Dr. Hincks, who, since the time of his arrival in Belfast in 1821, has uniformly exerted himself to extend and foster a taste for such pursuits, has informed me, that, for thirty years prior to that period, it formed a part of his course of instruction, both in Cork and Fermoy; and that he was always satisfied with the results. The course which I recommend cannot, therefore, be viewed as good only in theory: it is borne out by the experience of those who have had the best possible means of arriving at just conclusions on the subject.

If reflecting and educated parents were to concur in the views here expressed, and were to require that Natural History should be taught to their sons, as regularly as Geography, its introduction into schools would soon become general, and by every teacher it would be studied as invariably as Geometry or Classics. At present it is needful that some direct advantage, such as a preference over rival candidates, should be held out to induce those who are anxious to gain employment as tutors, to acquire previously a knowledge—even an elementary knowledge—of Natural History. Were all teachers specially educated and trained for the duties of their important calling—were they all, if not conversant with the science, at least familiar with the art of education, a pursuit bringing with it the claims already enumerated, might be left to work its way to its proper place in school education. But as this is not the case at the present time, I can only hope for its introduction into the schools established for the middle and upper classes of society, from two causes:

1st, The increasing desire of parents that it should be taught; and

2dly, The enlightened competition now existing among the principals of many schools, founded on the endeavour of each to make his own system of instruction the best and most comprehensive. To this spirit we may now attribute its introduction as a branch of general education into several first-class schools; and as we all know the influence of example, we may

rest assured that in this particular they will, ere long, be imitated by others.

With respect, however, to schools for the humbler classes of society, we naturally turn our attention to those under the Commissioners of National Education. In examining their school-books we find, that the fitness of Natural History as a branch of education is admitted; for they contain rudimentary instruction in different departments.

But at the present time, Natural History does not form a part of the course of instruction to which teachers are subjected in the training schools. It is left to the capabilities of each individual teacher, and the exertions of any zealous superintendant, to furnish the requisite information for converting the lessons into a text-book. This is to be regretted, for it is leaving to chance, the acquisition of that knowledge which ought to be the regular result of systematic study. We are to consider, however, that the National Schools of Ireland are as yet in their infancy. That the system is one containing, in itself, expansive principles; and that with the growing wants, wishes, and capabilities of the people, a more varied and more substantial kind of mental diet will be afforded. There would, however, be no impropriety in making known to the Commissioners the views entertained by this Society on the subject, and respectfully recommending the introduction of Natural History as a portion of the preparatory course prescribed to their teachers. Were it effectually introduced, the birds, the flowers, the insects which are seen in every walk, would supply the teacher with ample materials to arrest the attention, and awaken the curiosity of his juvenile auditory. Each fact which he had acquired from the professor in the Metropolis, would by him be communicated to successive hundreds throughout the country. A taste for what is intellectual rather than for what is sensual would thus be generated, and be productive of the happiest effects on the character and morals of the community. Nor is it too much to expect, that when there existed knowledge on the part of the master, and zeal on that of the pupils, little collections would gradually arise, specimens of Natural History would be the chosen ornaments of the school-

house, and the pupils would look with pride on local museums of their own formation. Emulation would make one teacher desirous that his school should not, in this respect, be inferior to another; and thus gradually a small collection formed, almost without any expense, and illustrative of the prevailing character of the mineralogy, botany, or zoology of a limited district, would be found attached to the village school. Even in those schools which might remain unconnected with the National Board, the same effect would, from imitation and competition, be gradually produced. I need scarcely say a word on the advantage which the science itself might be expected to derive from the host of zealous cultivators thus raised up, and who, through their teachers and superintendants, would be in connection with the Natural History Professor in the Normal School, and with the Museum, exclusively of Irish specimens, which would there be formed. Such a collection would not only supply the illustrations required for his course of lectures, but would be of high importance as exhibiting the natural productions of Ireland.

But I would not rest satisfied with the introduction of Natural History into schools: I am anxious that it should take its place among the physical sciences in our colleges. Not as a thing which students may attend or not as they think fit, but as a *regular and indispensable* portion of their collegiate course. There are always among the mass of students in every college, so many who are anxious merely "to get through," that, unless attendance on a Natural History course be rendered imperative, and the attention of the student tested, both by oral examination and written exercises, a Cuvier might lecture to almost empty benches. It is a matter of which every one connected in any way with colleges is cognisant, that a very large number of young men pass the entrance examinations, who are but badly prepared for entering with advantage on the higher departments of Literature or Science. To such, the study of Natural History would be of very high utility. It would teach them *to observe* and *to reason*, and thus prepare them for pursuing effectively the more recondite sciences. And if from time to time they afterwards reverted to the pursuit,

as a relaxation of the mind after intense thought, or laborious application, it would be found invaluable, and tenfold more efficacious as a restorative than hours of relaxation or indolence. I speak of it here merely as it would appear to students; this would not be the place to treat of its own high claims as a science, or the deep and varied knowledge requisite for the philosophy of its higher departments.

To those whose college course is but preparatory to their entering on the solemn duties of the clerical profession, the study of Natural History offers inducements derivable not only from its immediate effects, but from its results after their entrance on the Christian ministry. God has been pleased to grant us two revelations of himself: his works, and his revealed word. It is in these two volumes we must seek for a knowledge of the divine Author. As both emanate from him, they must, when rightly studied, be found in perfect accordance, and must mutually illustrate each other. One truth, we may rest assured, can never be opposed to another truth. It is obvious, therefore, that, by him whose business it is to declare to his fellow-men the will and the attributes of the Most High, BOTH volumes should be sedulously perused, compared, and studied.

But when the duties of the ministry are fairly entered on, and the expounding of the sacred volume becomes the object of the young clergyman, how is he adequately to take advantage of the similes drawn from the objects of Natural History, if that pursuit has not formed one portion of his preliminary studies? The references to the animal and vegetable world, contained in the scriptures, are almost innumerable, and executed with such beauty of colouring, that the Naturalist may in vain seek elsewhere for descriptions so true and so poetical. Why should so rich a mine continue unworked? Why should not the imagery drawn from the earth, the air, and the seas, be rendered available, in the fullest extent, to the promotion of HIS glory, who "in wisdom hast made them all?" This can only be done by the student of Divinity, being the student of Natural History also.

If the study be introduced—as I trust it will—into the schools throughout the land, another reason would arise for

the clergyman being informed on the subject. He must in the extent of his information be always in advance of his flock; and in no respect whatever must his education be merely equal to theirs. It must, in fact, be always of a higher grade. If they learn the *rudiments* of Natural History, he must become conversant with it as *a science*. When he would afterwards bring before their notice the powerful wing, or piercing sight of the eagle,—when he would ask "who provideth for the raven his food?"—when he would expatiate on the lilies of the field, or desire the sluggard, in the words of Solomon, "to go to the ant, consider her ways, and be wise,"—he would speak to his auditory of matters which they were prepared to understand. He would address them on a subject of common interest, and one perfectly within their comprehension. Need I remark, how delightful to a clergyman it would be, thus to command the attention and assent of his auditory, and to feel that every word he uttered was understood!

In Ireland we have three Colleges for the education of clergymen:—Trinity College, Dublin, for those of the Established Church; Maynooth, for those of the Roman Catholic persuasion; and the Royal Academical Institution of Belfast, for Presbyterians of every denomination. In Trinity College there is a Professor of Botany, and a Lecturer on Zoology; but attendance is not required on either of these courses preparatory to taking out the degree of Bachelor of Arts. In Maynooth there is at present no Natural History Chair, a want which some of the dignitaries of the Roman Catholic Church sincerely regret. In the Medical School of the Belfast College there is a Chair of Botany, but not of Zoology. Such studies are not rendered imperative on their students by any of the religious bodies in this country, with the single exception of the Covenanting Synod. They require attendance on Natural History for one session; but as their body is not sufficiently numerous to endow a Professorship, their students have, for the last three or four years, attended a four months' course, by our fellow-member, Dr. J. D. Marshall,—two lectures being delivered in each week.

To raise Natural History to a higher rank, and more promi-

nent station in our Irish colleges, would be most desirable. I believe, a wish that such should be the case prevails in many influential quarters; and as that wish increases, it will find means and opportunity for its fitting expression. Meantime, I respectfully suggest, that something might be done in our own province, and in our own town, by directing public attention to the subject. Some of the proprietors of our Royal Academical Institution are sincerely desirous of seeing the course of education there revised and enlarged. Some learned and reverend members of the Presbyterian body are persuaded, that an increase of the term of study at present prescribed to their students, would be highly desirable; and, also, that such a change should be accompanied by the introduction of new matter, and a revisal of that at present taught. This would seem, therefore, an auspicious time for bringing forward the views now submitted to your consideration. That a precedent may not be wanting for the change, which, I hope, will in time be effected in the course of college education in Ireland,—I may be permitted to refer to the University of London. Botany and Zoology form part of the matriculation examination; and in that for the degree of Bachelor of Arts, a comprehensive outline of animal Physiology, vegetable Physiology, and structural Botany is prescribed.

If we look beyond the boundaries of Great Britain, and note the practice of our continental neighbours, we shall find it gives, in support of the course here recommended, the unanswerable testimony of *experience*. On this subject, we have recently been put in possession of a well-arranged mass of information, in the Report by Professor Bache, already quoted.* This gentleman had been selected by the Trustees of the Girard College of Orphans, Philadelphia, to procure information with respect to the system of instruction pursued in similar establishments in Europe. For this purpose, he visited England, Scotland, Ireland, France, Belgium, Holland, Switzerland, Italy, and the principal states of Germany. It was not until two years had been thus spent, and 278 schools of various kinds

* *Ante*, page 20.

had been personally inspected, that Dr. Bache prepared his very valuable Report. From it we learn, that, in the great majority of the continental schools, Natural History forms a regular part of the course of instruction, and usually occupies from two to four hours in the week. In some places, it is connected with physical geography or with physics; in others, it stands out as a distinct branch of education, and attention is given to its different departments in successive years. The entire Report gives unequivocal evidence of its good effects in awakening "habits of observation and reflection;" and also of its being "eminently calculated to promote early religious impressions." It also states, that the experience of the Prussian Gymnasia may be appealed to "as proving the entire compatibility of such instruction, with an otherwise sound system; and the entire possibility of accomplishing it without neglecting other more important branches."*

Comment on such testimony would but weaken its effect. The fitness of Natural History, as a branch of general education, is alike established, whether we consider its own claims to such a position, or the experience of those places or countries where such claims have long since been admitted.

Gentlemen, I shall detain you no longer. I pray you to examine well the matter now laid before you. Separate it from the dross with which it may be combined; but if, when thus purified, it seems to you to contain any sterling metal, grant me your aid in giving it circulation, bearing the stamp of your approval.

* Page 497.

BELFAST:
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The paper being terminated, the President, Dr. J. L. Drummond, inquired, according to the custom of the Society, if any member or visitor wished to make any observations. Several gentlemen present then expressed their concurrence in the views brought forward in the paper; and casually noticed some of the obstacles which might be expected to interfere with their adoption. Among these observations, the following, made by the Rev. Dr. Bryce, seem deserving of particular attention, as he has for many years made the subject of education an especial object of study.

"Natural History employs a class of mental faculties not exercised by the studies in which children are usually engaged, and, therefore, furnishes a species of mental culture which can scarcely be attained by other means.

"Nothing is more absurd than to magnify one intellectual pursuit at the expense of another—to set up science against classics, classics against science; or this science against that. All are essential: and he is but a fraction of an educated man who has confined his attention to one.

"The great obstacle in carrying into effect the views brought forward in the paper, will be the deplorable apathy which at present exists with respect to intellectual education. Parents, in general, are anxious merely to give to their son those acquirements—often little better than mechanical—which are needful to fit him for some particular pursuit. This is mistaken and short-sighted policy. It gives knowledge, but without that intellectual training which would turn the knowledge to good account. It aims at enabling a youth to *make* money, but without fitting him to *enjoy* it."

The Chairman remarked, that, by some people, the objection was made, that a taste for science drew off the attention of young men from their business. To disprove the assertion, it was only necessary to appeal to the experience of the society he then addressed, as among its most useful and active members would be found those who were the most occupied with their own business avocations.